IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Group Art Unit 1713

In re

Patent Application of

Khalid Mentak

Application No. 09/917,971

Confirmation No. 1604

Filed: July 30, 2001

Examiner: Zalukaeva, Tatyana, Ph.D.

"WATER PLASTICIZED HIGH REFRACTIVE INDEX POLYMER FOR OPHTHALMIC APPLICATIONS"

I, Sally Sorensen, hereby certify that this correspondence is being deposited with the US Postal Service as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date of my signature.

Sally Sorensen
Signature

November 24, 2003
Date of Signature

DECLARATION OF KHALID MENTAK, Ph.D.
UNDER 37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Khalid Mentak, do hereby declare and state the following

1. I am curretly a consultant of Surgidev Corporation/Advanced Vision Science, Inc. (hereinafter, "Surgidev"), located at 5743 Thornwood Drive, Goleta, California 93117, previously I was President and Chief Executive Officer of Surgidev. Prior to that, I was Director of R&D, Regulatory Affairs, and Clinical Programs.

2. I received a Bachelor of Science Degree in Physics and Chemistry from University Mohammad V Morocco in 1987. I received a Doctorate degree in Materials Sciences and Engineering from the University of Florida, Gainesville in 1993. I have worked in

the field of biomedical Engineering, specializing in opthalmic and medical polymers since at least as early as 1991. Attached hereto as Exhibit A, is a copy of my *curriculum vitae*.

3. I have published at least 7 articles in the field of Biomedical Material Engineering.

4. I am the inventor of the claimed subject matter of the above identified patent application. I make this declaration in support of prosecution of the application before the U.S. Patent and Trademark Office.

5. I have read and understood the invention as disclosed in the above identified patent application, including the invention described by the presently pending claims.

6. I have reviewed an Office Action from the U.S. Patent and Trademark Office mailed, May, 27 2003. I understand that claims 33, 34 and 37 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,731,079 issued to Stoy (hereinafter "Stoy"). I further understand that claim 35 stands rejected under 35 U.S.C. § 102(b) as anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as obvious over Stoy, and that claim 36 is rejected under 35 U.S.C. § 103(a) as being obvious over Stoy. I believe that the evidence presented hereinbelow demonstrates that none of the pending claims are anticipated or are obvious in view of the Stoy patent.

7. The Office Action states that the Stoy patent anticipates claims 33, 34, 35 and 37 of the current invention and renders obvious claim 36, as the methods of manufacturing an intraocular lens of the present invention are either fully disclosed or suggested by the Examples of Stoy. I submit that the Stoy patent does not disclose all of the elements and limitations of the claimed methods of the presently claimed invention. Specifically, Stoy does not disclose or suggest, inter alia, a method of manufacturing an intraocular lens wherein a rigid, hydratable copolymer is provided, and wherein the third monomeric component of the copolymer, comprises a high water content hydrogel-forming monomer (underlined language in claims).

8. Hydrogels are defined as crosslinked three-dimensional polymeric networks capable of absorbing and holding, in equilibrium, certain amounts of water. A significant change in physical properties occurs upon hydration. This includes an increase in dimensions (i.e., swelling), a change in refractive index, and a decrease in rigidity.

9. A monomer needs to have certain properties in order to form a hydrogel in a homopolymer state. The monomer needs to have hydrophilic groups capable of binding and retaining water as a solute. More importantly, such moieties need to remain available for water molecules after polymerization. The hydrophilic character of the monomer decides the thermodynamic feasibility of water diffusion and retention by a polymer network. However, hydrophilicity is not sufficient to ensure that a monomer is hydrogel forming. The monomer must also allow water diffusion into the polymer network. Water diffusion in crosslinked polymer networks is based on the free volume theory, which postulates that polymer systems demonstrate the presence of void space or unoccupied volume. Free volume is a result of packing irregularities and long-range monomer interactions which give rise to excluded volume effect.

10. The free volume theory postulates that for diffusion to occur, water molecules must jump from one void to the next. The probability of finding free volume between V' and V'+dV' is the average distribution of free volume between P(V'):

$$P(V') = \gamma/V_f \exp((\gamma^{V'}/V_f)$$

γ is a factor which corrects for overlap of free volume associated with two or more molecules.

11. Water can diffuse through the gel if it finds a succession of holes larger than the water molecules. The conformal probability of forming a hole sufficiently large for the solute in one jump v is:

$$P(v) = \int_v^{\infty} P(V')dV' = \exp(\gamma^{v}/V_f)$$

The required free volume is the cross-sectional area times the jump length:

$V=\pi r^2\lambda$

Where r is the hydrodynamic radius of the solute. Yet water molecules can only pass through this volume if it's not blocked by crosslinked chains of the network.

The relative water diffusion coefficient is:

$D = P \exp(-Y/Q-1)$

Where P is the sieving probability. Y is a structural parameter. Q is the volume degree of swelling of the polymer network.

12. The sieving mechanism is described in terms of network mesh size. The sieving probability is proportional to the volume fraction of mesh size larger than a critical mesh size Mc. If the effective chains are far apart so that entanglements exist, diffusion is not obstructed by the chains, and the upper limit of Mc is the number average molecular weight of the uncrosslinked polymer. The lower limit of Mc is the value of Mc below which the solute is always screened. If the polymer network is unusually highly crosslinked water molecules are not able to jump from one void to the next, hence water cannot diffuse into the polymer network. This type of crosslinked polymeric network cannot absorb and hold water and is not hydrogel forming.

13. For instance, A PHEMA hydrogel crosslinked with 0.1% EGDMA or EGDA has a mesh size of 15 Å and absorbs a substantial amount of water. Polymer networks with mesh size in the range of 5 Å absorb little or no water due to the difficult or absence of diffusion of water molecules (3.2 Å).

14. Crosslinking agents such as ethylene glycol dimethacrylate (EGDMA), ethylene glycol diacrylate (EGDA) and tetra ethylene glycol dimethacrylate (TEGDMA) are commonly

polymerized with other hydrophilic monomers to form hydrogels. They are used in small concentrations less than 10%, typically in the range of 1-2%.

15. Crosslink density has a dramatic effect on the ability of a given hydrogel to hold and retain water. The greater the crosslink density, or concentration of crosslinking agent, the smaller the mesh size of the polymer network and the lower the equilibrium water content (EWC). Polymerizing a crosslinking agent such as TEGDMA alone would create such a tight polymer network that water molecules cannot diffuse into the bulk of the polymer. Such materials cannot absorb or hold water. Because of the hydrophilic nature of the monomer, water may adsorb to the surface of the polymer, but will not diffuse into the bulk of the material. Such polymers do not fit the definition of a hydrogel.

16. Stoy teaches an intraocular lens wherein benzyl acrylate, styrene and tetra-ethylene glycol-bis-imethacrylate (TEGDMA) is polymerized and formed into a lens. The Examiner indicates in the Office Action that TEGDMA is shown to be a hydrogel forming high water content monomer by U.S. Patent No. 5,453,530 issued to Byerley et al. (hereinafter "Byerley) in Col. 9, lines 32-40 and U.S. Patent No. 4,962,170 issued to Chromecek et al. (hereinafter "Chromecek") in col 3, lines 44-46. (See Office Action page 5).

17. In Byerley, the patent describes the use of TEGDMA in conjunction with thioacrylic and thiomethacrylic acids to form hydogels In this instance, TEGDMA is used as a crosslinking agent the same way it is used with other hydrophilic monomers to form hydrogels. In my opinion, there is nothing in the section highlighted by the examiner that suggests that TEGDMA, polymerized alone or with another crosslinker, can yield a hydrogel.

18. Chromecek teaches a method of making highly adsorptive polymers. The key element of this invention is to create highly crosslinked polymeric particles that retain certain liquids by surface adsorption, but not bulk absorption. A powder with small particle size was preferred for increased surface area and hence enhanced superficial adsorption volume. The particles are not made highly porous to minimize swelling by liquid absorption.

More specifically, TEGDMA as monomer was selected for this invention to produce highly crosslinked non-swellable polymers, but with the ability to adsorb water on particle surfaces. This reinforces the point that TEGDMA is not hydrogel forming.

19. For reasons set forth above, in my opinion, the present invention, as set forth in the claims 33-37, is not anticipated or obvious over Stoy.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 11/21/03

Khalid Mentak, Ph.D.

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EXHIBIT A

KHALID MENTAK
CURRICULUM VITAE

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Highlights:

--Ph.D. in Materials Sciences and Engineering.
--Extensive experience in biocompatible polymers, surface, modification of polymers and hydrogel synthesis.
--Strong analytic and problem solving abilities.
--Confident and decisive under pressure.

Education:

Ph.D. in Materials Sciences and Engineering 1993,
University of Florida, Gainesville Florida.
Dissertation Topic: Synthesis and Characterization of Hydrophilic Grafts and Solutions for Biomedical Applications.

M.S. in Materials Sciences and Engineering 1991
University of Florida, Gainesville, Florida. Emphasis on Hydrophilic surface modification of polymers.

B.S. in Physics and Chemistry 1987
University of Mohammad V, Rabat, Morocco.

Experience:

3/98 - present — President and Chief Executive Officer.
Surgidev Corporation

5/95-3/98 — Director, Research and Development, Regulatory Affairs and Clinical Programs. Supervised all aspect of research and development of medical devices. Designed and implemented regulatory strategies. Implemented process improvement programs in Research and Development and manufacturing.

4/93 - 5/95 — Manager, Research and Development. Managed Research and Development activities for polymer materials, interfaced with regulatory affairs and manufacturing departments. Established a polymer analysis laboratory.

9/88 - 4/93	Graduate Research Assistant. Department of Materials Sciences and Engineering. University of Florida. Synthesized and characterized hydrophilic and bioactive grafts onto intraocular lenses (IOL's) and vascular prostheses. Developed improved viscoelastic solutions for use in ophthalmic surgery. Developed wound dressing materials for surgical adhesion prevention. Synthesized drug-loaded microspheres for intra-tumoral chemotherapy and targeted drug therapy. Conducted in vitro testing to evaluate cell response to polymers. Conducted several in vivo studies in collaboration with surgeons to evaluate (1) effectiveness of intra-tumoral chemotherapy using drug loaded microspheres, (2) effectivness of medicated viscoelastic materials in ophthalmic surgery.
1997 - 1988	Research Technician. Department of Biomedical Engineering at the University Pierre et Marie Curie, Paris, France. Obtained an excellent background in a wide range of polymer characterization methods, chemical assays, and cell culture.
Professional Skills:	Extensive experience in radiation-induced graft polymerization and polymer characterization including scanning electron microscopy (SEM), optical microscopy, X-ray photoelectron spectroscopy (XPS), intra-red spectroscopy (FTIR/ATR), UV/VIS spectorscopy, gel permeation chromatography (GPC), rheology, thermal analysis (DSC, TGA), goniometry and mechanical testing (Instron).
Patent Applications:	A Novel Method for the Surface Modification of Ocular Implants, Surgical Instruments, Devices, and Contact Lenses. Improved Viscoelastic Material for Ophthalmic Surgery. Synthesis of Biocompatible Iso-osmolar Gels for Mammary Prostheses.
Societies:	Society of Plastic Engineers, American Society for Cataract and Refractive Surgery, American Chemical Society, The American Academy for the Advancement of Science, Surfaces in Biomaterials Society, ANSI Committee Z80.7
Publications:	See attachment for complete listing.
References:	Available upon request.